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others to do so, to ensure the success of the dance in aid of the Stockbridge Club? This, the first dance to be held in the Academy Hall, will take place on Friday, 26th June. A number of tickets are as yet unsold, and immediate application for them is requested. Dancing tickets (30s. the pair), and bridge tickets (£3 for a set of four) can be obtained from any of the undersigned members of committee—and from the Rector's Clerk.—Yours, etc.,

N. E. LYON,  
"Greenaway," Kinnear Road.

LADY MURRAY, 62 Great King Street.  
MRS. FREEMAN, 91 Comely Bank Avenue.  
MRS. MACONCHIE, 23 Northumberland Street.  
MRS. DAWSON, Jeffrey House, Kinnear Road.  
MISS A. ROBERTSON, 30 Inverleith Place.  
MR. JOHN CHIENE, 3 Charlotte Square.  
MR. T. E. P. M'CANDLISH, 38 Raeburn Place.  
MR. B. R. TOD, 8 Learmonth Place.

### JAMES CLERK MAXWELL

IT can have fallen to the lot of few schools—none, I think—to have been able to celebrate in one brief half-term the centenaries of two such men as Peter Guthrie Tait and James Clerk Maxwell. It is true that Stratford-on-Avon has Shakespeare, but it has no make-weight to complete the balance, and I apologise to the shade of Tait for seeming to slight him. You doubt the comparison? Perhaps you are right; but I would like to put to you one or two questions in justification. Which was greater? Michael Angelo or Homer? Beethoven or, say, Plato, or in a humbler sphere, Bobbie Jones or Lindrum? It is difficult to compare incommensurables. I hesitate to answer the question, "which is the greater, a man who can see into the heart of man or into the heart of Nature?" Shakespeare admittedly did the one. Did Maxwell do the other?

Now the Academy has had many famous men among her sons, whose portraits adorn her walls. Some have been distinguished in the religious world: we have had an Archbishop of Canterbury. Some have achieved military distinction: we have had our share of V.C.'s and Generals. The Academy has always been distinguished in the legal world: we remember with pride our long list of Senators of the College of Justice, and of men distinguished in the politico-legal world. Recently we mourned the demise of Lord Finlay and Lord Haldane. Literary men, as is well known, have always had a home here: the portraits of Andrew Lang and Robert Louis Stevenson hang upon our walls, with others of whom time fails me to tell. But it seems more and more certain that few, if any, add so much lustre to the name of the Academy in the broad world without

its walls, and outside the British Isles, as James Clerk Maxwell. By one of the leading physicists of America, Prof. R. A. Millikan, he has been described as "one of the most penetrating intellects of all time." Yet a prophet is not without honour!—and it is only slowly that he has been recognised as one of those rare natures gifted to mankind only once or twice in a generation, men who are able in their own sphere of life to see into the heart of things, and whose greatness resembles that of some high Alp, whose height is not so easily grasped from a short as from a greater distance, when the more insistent foreground has sunk into its proper perspective. Yet the wind blows coldly at these high altitudes, and some men are apt to suffer from mountain sickness; the clouds often conceal the mountain tops, so the heights are apt to be forgotten, or their existence even denied.

I do not know if I will be able to give you the picture I have in my mind, but I want to give you the picture of a great, serious, mystical mathematician and physicist, who had been a shy, unconventional, ugly duckling of a boy and developed into a simple, generous, lovable soul, with a delightfully flippant sense of humour.

In what follows I am much indebted for facts and very many phrases to the standard Life of Clerk Maxwell by his classmate, Lewis Campbell, which boys are advised to read for themselves.

Though much of his earlier life was spent in the wilds of Galloway, Clerk Maxwell was an Edinburgh boy. He was born on the 13th June 1831, only a moderate gunshot distance from the Academy, at 14 India Street. His father was at the Bar, but apparently not making much by it, seemingly being more interested in the advance of science. Fond of the country, when a chance presented itself, he bought the estate adjoining that of his own small possession of Middlebie in Kirkcudbrightshire, where he built the house of Glenlair, whither the family shortly thereafter removed.

The bookish education of the small boy up to the age of eight was undertaken by his mother, though his real education was going on all the time, for his father's interest in scientific matters seems to have been conveyed on to the son, helped by the very considerable bond of sympathy that existed between them. Two of his early accomplishments stand out from the rest. He seems to have possessed a wonderful memory, and at eight years old could repeat the whole of the 119th Psalm, and be able to give chapter and verse for most quotations from the others, while an insatiable curiosity as to the working of things characterised his earliest years, and is reflected in such expressions as "Show me how it *doos*." "What

does it *do*?" "What is the *go* of that?" and if the answer was not sufficiently clear to his mind, "But what is the *particular* go of that?" which have come down to us. But a disaster overtook the little family. His mother died when James was only eight. It is a curious coincidence that the three great physicists of his time, Kelvin, Tait, and Maxwell, each lost one or other parent before the age of ten. In this case the result was an intensifying of the close relationship of father and son, between whom there existed the closest understanding all their days, and a consequent deepening of interest in what was to become his life work.

For a couple of years trial was made of a tutor, but it was plain that he would be better at school, and his father placed him at the Edinburgh Academy, where in November 1841 he entered the Second Class under Mr. Carmichael, with whom, after the fashion of the time, he remained till he was in the Fifth Class.

Perhaps the absence of a mother's eye was responsible for the most unfortunate début of James at the Academy. In the wilds of Galloway, he had been wearing clothes designed in a sensible but unconventional style. Picture to yourself a boy clad in a tunic, with a nice skirt, a frill for a collar, and square-toed home-made boots, with beautiful brass clasps. Even nowadays, with an extra century of civilisation, the costume would excite remark. What wonder that in the prehistoric stage of civilisation reached by the Academy boy of these days, before he had been in the School an hour, James had had his first fight, and goodness alone knows how many others in the course of the day! At any rate he arrived home at 31 Heriot Row, where he stayed during his schooldays, without the skirt, with a torn frill, generally disreputable, and apparently unperturbed; but as he was not given to showing his feelings, it is possible that he may have suffered from this, "his first contact with savages." Nor did he and his companions ever quite understand each other fully. He was built differently from them, and people always have a difficulty in recognising the swan in the perfectly obvious ugly duckling. It is true that after a display of Berserker rage on one occasion, he was thereafter left alone. But while he took exercise, he was not fond of the organised game. He was fond of the odd game, swimming, pole jumping, and did wild gymnastics on those trees that used to be down the bank, but of the game as the business of life he took no heed. He went walks with his father, geologised on Arthur's Seat, visited works and objects of scientific interest. He was angular in manners, and his voice was monotonous and hesitating; he was in fact a typical ugly duckling. What wonder that, as in the case of George Wilson in Mark Twain's

story of "The good little boy who did not prosper," his companions figured it out that he must be mentally afflicted, and his early nickname of "Dafty" stuck.

At first, too, he was not a great success in class, and budding Clerk Maxwells may take comfort in the fact that he counts it a red-letter day when he rises to fourteenth in general order. It has sometimes been claimed that for the best brains classics form an ideal education. It may be so with many, but I think that any fair-minded man must admit that it is a very doubtful proposition in this case, and indeed we must admit that while he did ultimately escape disaster and was glad of his classical education, it was a close call, and but for his mathematical ability he might easily have made shipwreck. Apparently he fell off at first badly, and showed little sign of intelligence till later, when he started the subject of geometry. This saved him, for there is no doubt that he got enormous and vital stimulus when he reached Dr. Gloag's classes, when even his classics improved. Ultimately he made good in them also, just missing being Dux of the School in his last year, a place won by his biographer, Lewis Campbell.

But to return to his mathematics. His had always been a mathematical brain. As a boy of thirteen, before any study of geometry, he writes to his father that he had made "a tetrahedron, a dodecahedron, and two other hedrons whose names I don't know," a remarkable effort of visualising power for one so young. His dormant intelligence awoke under the mathematical stimulus. Not only did he get the mathematical medal in the Fifth Class, but he also got the first place for English, and rose to eleventh in scholarship. Next year he blossomed out amazingly, and as a schoolboy of fifteen read his first paper to the Royal Society of Edinburgh on "Ovals of the form  $mr + nr^2 = \text{const.}$ , and practical methods of drawing them." Many of you know how to draw an ellipse by help of two pins and a piece of thread, and this paper develops this idea to draw egg-shaped curves. After this we find him doing "props" in season and out of season, exchanging them with his friend Tait, just as a couple of silly schoolgirls might exchange love letters. Still, this incessant working at mathematical and physical science, with the concomitant incessant making of models and apparatus, was probably what most developed him in his last years at the Academy.

Of a third great way of developing the human mind, the scientific, Maxwell had little experience at the Edinburgh Academy, though we do hear that "to keep abreast of the requirements of the time" one of the classical masters gave them science out of a book; but all that is known about this is that Maxwell and Tait seemed to know much more about the subject than the master in charge.



In 1847 he went to Edinburgh University with Tait, who had been brilliantly following up Maxwell, dux year after year in the class taught by Mr. Cumming. But while Tait stayed only a year before proceeding to Cambridge, Maxwell stayed three. He took classes in mathematics, physics, and moral philosophy in particular, being greatly influenced by the teaching of Sir William Hamilton in the last subject. I fancy he was not overworked at this time, but he did an amazing amount of miscellaneous reading, thinking, and private experimenting. He developed his ideas on polarised light, worked at various problems of mathematics, read another paper to the Royal Society—on rolling curves—while not yet eighteen; he read classics, he read philosophy; he worked at galvanism. It causes little surprise that after all this confused feeding, when he went to Cambridge he appalled his tutor there by his lack of method, though the latter recognised that Maxwell's store of knowledge was immense, and was impressed with the fact that it was wellnigh impossible for him to think incorrectly on any physical subject.

It was probably in an effort to please his father that he had not gone south sooner, for the old man wished his son to take up law. However, James reluctantly came to the conclusion that it was a different kind of law that he was better fitted to study, and so in 1850, like Tait, he entered the college of Peterhouse, "that ancient foundation that has given to the world so many distinguished mathematicians." It was for this very reason that he stayed only one term, migrating to Trinity, as he thought there might be a greater chance of a Fellowship at the larger college.

Again his idiosyncrasies handicapped him. Again he did not take part in the organised game. Again he went in for the solitary form of exercise to keep himself fit, a very necessary thing in that relaxing climate. He walked; he sculled; he swam. In the latter connection Professor Tait records that in entering the water he used to turn a full somersault in the air before reaching the surface, flat, at full length—a method that Maxwell said stimulated the circulation! He also tried experiments in the arrangement of the hours of his work that must have made him less liked. Finding, as many a student has done, that the midnight hours are the best for study, he tried the plan of going to bed at 5 P.M., getting up in the late evening, working till 2 A.M.; when from 2 to 2.30 "he took exercise by running along the upper corridor, down the stairs, along the lower corridor; then up the stairs, and so on, until the inhabitants got up to have shots at him with boots, hairbrushes, etc., as he passed."

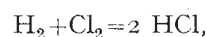
By no means had he confined himself to the work for his tripos. He still read omnivorously. He had

flitted what his father called his "bits of dirt" from Glenlair to Cambridge, and he continued his experimenting, even under the shade of the approaching tripos. But he was not a senior wrangler. To the end of his days his mind made many jumps that less nimble-witted men were unable to follow, and while it was impossible for him to think incorrectly on any physical subject, it seems to have been almost equally impossible for him to write out his thoughts with mercy for his readers, unless he took special pains to do so. Hence in the tripos he was beaten by dear old Dr. Routh of Peterhouse, and he had to be content with second place.

At this stage of his life he is remembered as a brilliant talker. While apt to be silent in company, with a small company he impressed his friends with the breadth of his information. "I do believe," says one, "there is not a single subject on which he cannot talk, and talk well, too, displaying the most curious and out-of-the-way information." But he must have been a terrible trial to men without a sense of humour, the more so that he never laughed, for he rarely spoke or wrote without jesting. His letters to his intimate friends abound with this quality of seemingly serious remarks that are really absurd nonsense. At times the most serious of men, at others he could not resist the temptation to put things in an absurd way, calculated to convey misinformation to the careless or literal reader. For instance, he writes seriously to some one: "Are you aware that the electric flash is entirely due to the resinous particles of electricity? This is well known on the stage, where they blow the particles through a tube over a candle to make stage lightning. The vitreous electricity has nothing to do with it, as you may prove by using powdered glass." Or again take a letter to Tait as example, where he gives a very garbled account of a paper by Professor W. K. Clifford on chemical equations. He writes: "The equation

$$XX + LL = 2(XL)$$

was the first selected. He observed that both the constituents of the left member were in the liquid state, and though the resultant might not be familiar to some members, he could warrant it  $2XL$ . From an equation of similar form,



he deduced by an easy transformation

$$H^2 - 2HCl + Cl^2 = 0.$$

Whence by extracting the square root,

$$H - Cl = 0, \text{ or } H = Cl,$$

a result even more remarkable than that obtained by Sir R. C. Brodie."

(To be concluded)